

# MODULAR ENCLOSURE SYSTEM

## DESCRIPTION

### BACKGROUND OF THE INVENTION

**[Para 1]** The present invention relates generally to enclosure assemblies and, more particularly, to a flexibly arrangeable modular enclosure system.

**[Para 2]** Enclosures come in a wide variety of styles and orientations and have applications that vary from storage cabinets to corrosion resistant electrical boxes. These enclosures often come in variety of sizes as well as a variety of materials depending, in part, on the intended use of the enclosure. Indoor, non-corrosive environment enclosures are often fabricated from generally lightweight plastic materials whereas electrical cabinets in corrosive or industrial applications are often constructed from a stainless steel material. Regardless of the intended use of the enclosure, these enclosures often come only in a variety of standard sizes. Requiring an enclosure having dimensions other than the provided standard sizes either requires significant modification of a standard enclosure or ordering an enclosure that is then manufactured with the desired specifications. As such, requiring a custom made enclosure having a size other than a commonly provided enclosure requires either, significant time and labor to modify a common enclosure, or a substantial increase in cost associated with a special order enclosure.

**[Para 3]** The intended use of an enclosure is an additional consideration of enclosure construction. Enclosures generally referred to as electrical boxes generally provide knock-outs for openings through the enclosure housing to allow wire access therein. Forming the knock-outs increases the production time required to form a single enclosure. The knock-outs are also often provided in a variety of standard configurations. Deviation from the standard knock-out orientation often requires significant in-field modification of the enclosure. As such, in-field modification of the orientation of the knock-outs increases the installation time of the enclosure. Additionally, depending on the material the enclosure is constructed, any modification of the enclosure may require special tooling and/or expertise to modify the enclosure.

**[Para 4]** Other enclosures, constructed from generally light weight plastic materials, lack a structural stability required for many applications. That is, these enclosures often require being supported on a floor and once loaded or filled, must be unloaded or emptied in order to be moved. These enclosures often require a generally flat and/or smooth footing surface in order to maintain the operability of doors that may be connected thereto. Positioning the enclosure on a footing surface that is even marginally non-planar and/or having a rough surface results in the interconnected components of the enclosure being misaligned which results in improper, if not

inoperable, association of the individual components of the enclosure such as moveable shelves and enclosure doors.

**[Para 5]** It would therefore be desirable to have an enclosure system having a plurality of components that are quickly and efficiently assembled, and easily customized to a variety of user selected dimensions and applications.

## BRIEF DESCRIPTION OF THE INVENTION

**[Para 6]** The present invention provides a modular enclosure system that solves the aforementioned problems. The enclosure system includes a plurality of interchangeable corner rails connectable to a plurality of interchangeable corner connectors. The interchangeable corner rails and corner connectors form a frame assembly constructed to receive a plurality of panel portions forming an enclosure about the frame assembly.

**[Para 7]** In accordance with one aspect of the present invention, an enclosure system is disclosed that includes a frame assembly. The frame assembly includes a plurality of edge rails, each edge rail being interchangeable and having a first end and a second end. The frame assembly also includes a plurality of connectors, each connector being interchangeable and having a connector flange extending outwardly therefrom. Each connector is constructed to engage respective ends of a plurality of the edge rails. The enclosure system includes a plurality of side panels constructed to be attached to the frame assembly, each side panel constructed to engage the connector flanges of a plurality of the connectors.

**[Para 8]** In accordance with another aspect of the present invention, a cabinet system is disclosed that includes an edge component having a generally curved portion and a pair of generally planar portions wherein a shoulder is formed between the generally curved portion and each of the generally planar portions. The cabinet system further includes a corner component having a body and a plurality of generally curved sections extending therefrom. Each generally curved section is constructed to be snugly received by the edge component between the shoulders formed thereon. Additionally, the cabinet system includes a plurality of side panels constructed to be received by the edge component on a side generally opposite the corner component and oriented to enclose a volume.

**[Para 9]** In yet another aspect of the present invention, a method of forming an enclosure is disclosed that includes connecting a plurality of interchangeable corners with a plurality of interchangeable frame rails to form an enclosure frame having a plurality of generally uniform panel mounting flanges. The method also includes mounting an enclosure panel to each of the generally uniform panel mounting flanges thereby enclosing a volume.

**[Para 10]** According to another aspect of the present invention, a modular container kit is disclosed that includes a plurality of corner connectors, a number of edge rails, and at least one sheet of generally planar material. The number of edge rails are of a predetermined length such that each of the edge rails are constructed to be severed to a user desired length wherein each severed end is engageable with a corner connector to form a frame assembly. The at least one sheet of generally planar material is constructed to be severable into a plurality of panels to engage the frame assembly and form the modular container.

**[Para 11]** Various other features, objects and advantages of the present invention will be made apparent from the following detailed description and the drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[Para 12]** The drawings illustrate one preferred embodiment presently contemplated for carrying out the invention.

**[Para 13]** In the drawings:

**[Para 14]** Fig. 1 is a perspective view of an enclosure assembly according to one embodiment of the present invention.

**[Para 15]** Fig. 2 is a perspective view of a portion of an edge rail of the enclosure assembly shown in Fig. 1.

**[Para 16]** Fig. 3 is an end view of the edge rail shown in Fig. 2.

**[Para 17]** Fig. 4 is a perspective view of one embodiment of a corner connector of the enclosure assembly shown in Fig. 1.

**[Para 18]** Fig. 5 is a perspective view of another embodiment of a corner connector of the enclosure assembly of Fig. 1.

**[Para 19]** Fig. 6 is a perspective view of a door corner exploded from a door edge channel of the enclosure assembly shown in Fig. 1.

**[Para 20]** Fig. 7 is a cross-sectional view of a corner, side panel, and door assembly of the enclosure assembly shown in Fig. 1 taken along line 7-7.

**[Para 21]** Fig. 8 is a cross-sectional view of a corner assembly with a shelf bracket of the enclosure assembly shown in Fig. 1 taken along line 8-8.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

**[Para 22]** Fig. 1 shows an enclosure assembly 10 according to the present invention. The enclosure assembly 10 includes a plurality of edge rails 12 and a plurality of corner connectors 14 connected thereto. Edge rails 12 and corner connectors 14 are constructed to be interchangeable with each edge rail 12 and corner connector 14,

respectively. Each corner connector 14 engages a plurality of the edge rails 12 such that the plurality of edge rails 12 and plurality of corner connectors 14 cooperate to form a frame assembly 16. A plurality of side panels 18 are connected to frame assembly 16 and enclose a cavity 17 therein. Enclosure assembly 10 includes a door assembly 20 that includes a plurality of door edge channels 22, a plurality of door corner connectors 24, a door panel 25, and a plurality of jam sections 26. Door assembly 20 is pivotably or removeably connected to enclosure assembly 10 by a hinge 27 or the like. A handle 28 provides a user of enclosure assembly 10 with selective access to cavity 17 contained therein. Optionally, door assembly 20 can include a window 30 to allow a user to visually inspect the contents of cavity 17 of enclosure assembly 10 without opening door assembly 20. It is equally understood that window 30 could also be located at any of the plurality of side panels 18 of enclosure assembly 10. Optionally, enclosure assembly 10 includes a plurality of adapters 30 constructed to quickly and efficiently connect to enclosure assembly 10 and allow connectivity with cavity 17 enclosed therein. Passage adapters 30 can be constructed to interconnect with any of a plurality of commonly used electrical, plumbing, gas, or other system lines or connectors. An optional pedestal assembly 32 includes a plurality of corner sections 34 interconnected by a plurality of rail portions 36. Corner sections 34 and rail portions 36 are interchangeable, respectively, and are constructed to be easily cut to user desired dimensions. Preferably, pedestal assembly 32 is constructed of a material similar to the material of enclosure assembly 10 and can be quickly and efficiently connected thereto. Additionally, it is further understood that corner sections 34 can be constructed with a tab (not shown) internal or external thereto for securely mounting pedestal assembly 32 to a supporting surface such as a floor, cat walk, or the like.

**[Para 23]** Figs. 2 and 3 show edge rail 12 of enclosure assembly 10. As shown in Fig. 2, edge rail 12 includes a body portion 38 with a pair of edge rail flanges 40 extending at edges 41 thereof. A step, or shoulder 42, is formed at the interface of each edge rail flange 40 and body 38 of each edge rail 12. A channel 44 is formed in each edge rail flange 40 and extends a length therealong, the importance of which is discussed further below with respect to Fig. 7. As shown in Fig. 3, an interior contour 46 of edge rail 12 has a pair of shoulders 48 positioned proximate edge rail flanges 40. Edge rail flanges 40 extend from body 38 in directions generally transverse to one another.

**[Para 24]** One embodiment of corner connector 14 is shown in Fig. 4. As shown in Fig. 4, corner connector 14 includes a body portion 50 with a plurality of protrusions 52 extending therefrom. Each protrusion 52 is constructed to snugly engage an edge rail 12 of Fig. 1. Referring to Figs. 3 and 4, an exterior contour 54 of each protrusion 52 of each corner connector 14 is constructed to slidingly engage a respective interior contour 46 of each edge rail 12 between shoulders 48. A shoulder 56 of each protrusion 52 of each corner connector 14 abuts, as shown in Fig. 2, an edge 58 of

each edge rail 12. Referring again to Fig. 4, each corner connector 14 includes a plurality of tabs 60 positioned between adjacent protrusions 52 of corner connector 14. Tabs 60 are constructed to generally align with a respective edge rail flange 40 of a respective edge rail 12 that is connected thereto. Such a construction forms what is commonly referred to as a butt joint between associated edge rails 12 and corner connectors 14. An alternate embodiment of corner connector 14 is shown in Fig. 5.

**[Para 25]** As shown in Fig. 5, corner connector 62 includes a body portion 64 with a plurality of protrusions 66 extending therefrom. Similar to each corner connector 14, an exterior contour 68 of each protrusion 66 of corner connector 62 is constructed to slidably engage the interior contour 46 of edge rail 12, as shown in Fig. 3, between shoulders 48 of a respective edge rail 12. Referring to Figs. 3 and 5, body 38 of each edge rail 12 is constructed to abut body portion 64 of a respective corner connector 62. A joint between edge rail flanges 40 of adjacent edge rails 12 forms one of what are commonly referred to as a half lap joint or a miter joint between adjacent edge rail flanges 40. In those enclosure assemblies 10 where increased frame rigidity is desired, it may be preferable to use corner connector 62 with the half lap joint or miter joint between adjacent edge rails 12 as compared to the butt joint formed when using corner connector 14. Regardless of which corner connector is applied, the rigidity of enclosure assembly 10 is further increased with the connection of side panels 18 thereto.

**[Para 26]** Similar to the engagement of corner connector and edge rail 12 of frame assembly 16, as shown in Fig. 6, door edge channels 22 and door corner connectors 24 of door assembly 20 are slidably connected. Door corner connectors 24 include a body portion 70 with a pair of protrusions 72 extending therefrom. Protrusion 72 is constructed to slidably engage a recess 74 formed in door edge channel 22. A tab 76 is formed between protrusions 72 of door corner connector 24 and is constructed to generally align with a door edge channel flange 78 extending from door edge channel 22. A groove 80 extends along a length of door edge channel flange 78 and is constructed to have door panel 25, as shown in Fig. 1, positioned thereacross.

**[Para 27]** Fig. 7 shows a cross-section of enclosure assembly 10 along line 7-7 shown in Fig. 1. As shown in Fig. 7, protrusion 52, 66 snugly engages edge rail 12 between shoulders 48 and each side panel 18 traverses groove 44 of edge rail flange 40 and abuts shoulder 42 of edge rail 12. Groove 44 is constructed to allow for the deposition of a bonding agent, such as glue, therein for fastening each side panel 18 to each edge rail 12. Each edge rail 12 is further defined as an outside edge rail such that enclosure assembly 10 includes a plurality of inside edge rails 84 constructed to be attached along a length of edge rail 12. Each inside edge rail 84 includes a pair of inside edge rail flanges 86 positionable along edge rail flanges 40 of outside edge rail. Each inside edge rail flange 86 of inside edge rail 84 includes a pair of grooves 88, 90. Groove 88 of inside edge rail flange 86 faces edge rail flange 40 of outside edge rail 12 and is configured to receive a bonding agent therein thereby securing each inside edge

rail 86 to a corresponding outside edge rail 12. Groove 90 of inside edge rail flange 86 is also constructed to receive a bonding agent therein such that an interior panel 92 of enclosure assembly 10 is securable thereacross.

**[Para 28]** A channel or chase 94 is maintained between inside edge rail 84 and a corresponding outside edge rail 12 and constructed to allow the passage of wiring therethrough. A cavity 96 is maintained between interior panels 92 and an adjacent side panel 18 of enclosure assembly 10. Optionally, an insulative material may be positioned or injected into cavity 96 thereby forming an insulated enclosure assembly. Jam sections 26 of door assembly 20 include a channel 96 formed along a length thereof. Channel 96 of each jam section 26 is constructed to snugly receive outside edge rail flange 40 and an associated inside edge rail flange 86. Jam sections 26 also include a stop 98 extending therefrom. Stop 98 includes a gasket 100 positioned thereat and constructed to sealingly engage door assembly 20 to enclosure assembly 10. Door edge channel 22 engages gasket 100 and seals cavity 17 of enclosure assembly 10 when door assembly 20 is oriented in a closed position. Grooves 80 of door edge channel flange 78 of door edge channel 22 are constructed to receive a bonding agent to secure door panel 25 and an interior door panel 102 about interconnected door edge channels 22. A cavity 106 is formed between door panels 25, 102 and is constructed to optionally receive an insulative material and/or a window 30, as shown in Fig. 1 therebetween.

**[Para 29]** As shown in Fig. 8, a support bracket 108 is attached to inside edge rail 84. Support bracket 108 includes a pair of grooves 110 formed therein and constructed to receive a bonding agent therein for securing support bracket 108 to enclosure assembly 10. Alternatively, a mechanical fastener 112, such as a bolt, may be used to secure support bracket 108 to inside edge rail 84 of enclosure assembly 10. As such, enclosure assembly 10 forms a sealed and insulated enclosure cavity that does not require any mechanical fasteners in forming the enclosure assembly. Additionally, the enclosure assembly can be formed by a pultrusion process having a plurality of interchangeable components. Alternatively, it is understood and within the scope of the claims that the plurality of interchangeable components of enclosure assembly 10 could be formed by an extrusion process. Regardless of the process applied to form the enclosure assembly, with a minimum of working, a user of the disclosed enclosure system can form an enclosure having multiple applications, sizes, and configurations with a minimum of workability of the individual components of the enclosure system.

**[Para 30]** In one embodiment of the present invention, an enclosure system includes a frame assembly. The frame assembly includes a plurality of edge rails, each edge rail being interchangeable and having a first end and a second end. The frame assembly also includes a plurality of connectors, each connector being interchangeable and having a connector flange extending outwardly therefrom. Each connector is constructed to engage respective ends of a plurality of the edge rails. The enclosure system includes a plurality of side panels constructed to be attached to the frame

assembly, each side panel constructed to engage the connector flanges of a plurality of the connectors.

**[Para 31]** An alternate embodiment of the present invention has a cabinet system that includes an edge component having a generally curved portion and a pair of generally planar portions wherein a shoulder is formed between the generally curved portion and each of the generally planar portions. The cabinet system also includes a corner component having a body and a plurality of generally curved sections extending therefrom. Each generally curved section is constructed to be snugly received by the edge component between the shoulders formed thereon. Additionally, the cabinet system includes a plurality of side panels constructed to be received by the edge component on a side generally opposite the corner component and oriented to enclose a volume.

**[Para 32]** Another embodiment of the present invention includes a method of forming an enclosure that includes connecting a plurality of interchangeable corners with a plurality of interchangeable frame rails to form an enclosure frame having a plurality of generally uniform panel mounting flanges and mounting an enclosure panel to each of the generally uniform panel mounting flanges thereby enclosing a volume.

**[Para 33]** A further embodiment of the present invention includes a modular container kit having a plurality of corner connectors, a number of edge rails, and at least one sheet of generally planar material. The number of edge rails are of a predetermined length such that each of the edge rails are constructed to be severed to a user desired length wherein each severed end is engageable with a corner connector to form a frame assembly. The at least one sheet of generally planar material is constructed to be severable into a plurality of panels to engage the frame assembly and form the modular container.

**[Para 34]** The present invention has been described in terms of the preferred embodiment, and it is recognized that equivalents, alternatives, and modifications, aside from those expressly stated, are possible and within the scope of the appending claims.